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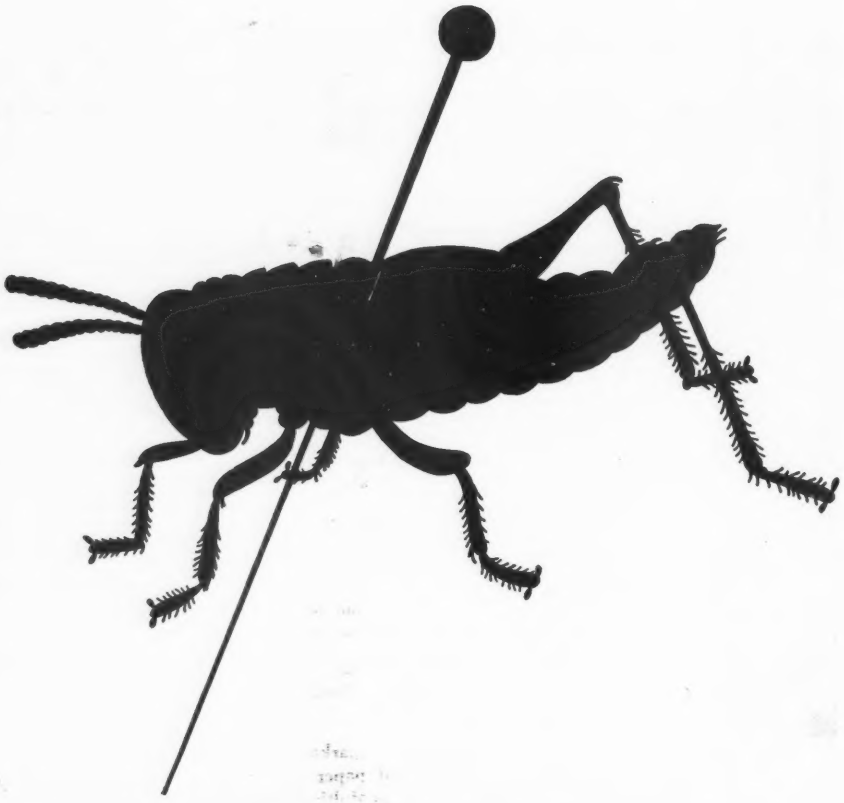

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The American FERTILIZER

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The Biochemical Significance of Phosphoric Acid for Farm Animals*

By DOCENT Dr. RUDOLF SCHREIBER

Institute of Agricultural Chemistry, Ludwigs-University, Giessen, Germany

A SUPPLY of phosphoric acid sufficient for the nutrition of plants depends not alone upon the customary cultivation of crops used for feed, but also on the role in which mineral constituents of feeds have to function in the animal body.

Minerals serve the metabolism as building materials and for this purpose phosphoric acid, together with calcium, are particularly important for the formation of the skeleton. Mineral elements in ionized forms also act in the physico-chemical cell metabolism as activators. In this form of solution within cells and also in various tissue fluids they are, by reason of their high molecular concentrations, particularly well suited to regulate osmotic pressure. Another particularly valuable function of phosphates lies in their buffering action by which the constancy of the *p*H concentrations in the animal body is accomplished. The most important function of ions is performed in their activation of changes in cell composition, in particular cell expansion and contraction, as well as salt formations with albumin, furnishing thereby the necessary consistency. to protoplasm. Furthermore, ions are importtant for the assimilation of nutrients, as well as for the removal of waste products, in which regard individual ions differ among themselves and render processes irreversible. Antagonisms appear between mono- and di-valent ions, in that di-valent alkaline earth-metals lessen permeability, whereas the monovalent increases permeability. But even among the ions of groups having the same valency there appears similar antagonism; for instance, in many cases Na+ and K+, but also Ca++ and Mg++, have shown antagonism. Further it is known that anions and cations possess reaction-equilibria among which the calcium:phosphorus (Ca:P) ratio is most important.

The maximum mineral requirements of animals is conditioned by the individual effects of ions upon cells, combined with the need of animals for growth nutrients. It may seem natural to assume that in experiments in metabolism, ingestion minus elimination would furnish a starting point for ascertaining the mineral requirement of animals. But that is not so, because many mineral elements, particularly phosphates, are rendered insoluble by the alkaline intestinal juices and are for the most part eliminated, unutilized, in the feces.

In the future it may be possible to eliminate these research difficulties in experimental metabolism through the use of radioactive isotopes.

By bombarding normal P^{31} with deutrons, isotope P^{32} is obtained, which can be used as a radioactive tracer. When an experimental animal is furnished a phosphate to which a small quantity of radioactive phosphorus is added, the step-by-step utilization of this phosphate may be followed through the animal body. It has already been established in

* Translated by J. F. Wischhusen, Manganese Research Institute, and V. Sauchelli, Davison Chemical Corporation. From *Chemiker Zeitung*, February 16, 1944.

this manner that the largest amount of phosphate in a growing animal is actually deposited in its bones. By far the smallest portion of this phosphate is quickly lodged in the liver, the kidneys and mucous membrane of the intestines; and in the pituitary gland phosphates are converted to and embodied as phosphatides. To trace this course of phosphate an infinitesimal amount of radioactive phosphorus only is required, so that injury to the animal body need not be feared, particularly because the exact dose needed can be determined through very sensitive apparatus.

Phosphorus Content of Feedstuffs

Commercial and natural feedstuff materials show great variations in phosphorus content as is shown in Table 1 in which the phosphorus content of crops used for feed has been listed according to quantity (*1*).*

TABLE 1
THE P_2O_5 AND PHOSPHOROUS (P) OF FEEDSTUFFS

Crop Materials	Total P_2O_5 %	One Kilo dry matter contains grams P		
		Total P	Inorganic P	Organic P
Wheat straw.....	0.17	0.38	0.15	0.23
Mangels.....	0.32	0.69	0.06	0.63
Clover hay.....	0.84	1.83	0.80	1.03
Meadow hay.....	0.96	2.10	1.20	0.90
Alfalfa hay.....	1.09	2.38	1.22	1.16
Kale.....	1.20	2.62	1.35	1.26
Potatoes.....	1.24	2.70	1.30	1.40
Corn (grain).....	1.39	3.03	0.28	2.75
Peanut cake.....	1.83	3.99	0.49	3.50
Wheat (grain)....	1.95	4.25	0.38	3.87
Cottonseed meal..	6.75	14.79	0.78	14.10

All seeds are rich in phosphorus which sometimes amounts to 50 per cent of the total ash. Furthermore, good meadow hay, legumes, rye, wheat bran, oil cakes are rich in phosphorus, particularly the cottonseed oil meal, as is seen from the above table. Sesame and poppyseed cake are also rich in calcium. Among animal sources used as feed are meat scraps and milk. More will be later mentioned about the P content of milk. Phosphate-poor are the straws of small grains and all agricultural commercial products, for instance sliced turnips which are used extensively as dairy feed in Germany.

So far as the diffusion of mineral matter, phosphorus, particularly in the animal organism is concerned, these are continuously displaced through the formation of lactic acid, pyruvic acid and phosphoric acid from neutral sugars and phosphoric acid esters. These reactions again cause ion displacements in blood, as was proved by the formation of lactic acid, and in muscles through muscle contraction due to formation of lactic acid derivatives. According to investigations of Neuberg, H. V. Euler, Embden, Cori and many others, phosphorylation is one of the essential sugar-splitting phases. These procedures cannot be further discussed here but deserve consideration since phosphoric acid plays an important role in them.

The supply of phosphoric acid to animals through feedstuffs takes place exclusively as salts or the esters of orthophosphoric acid. The combinations of phosphoric acid with the cations of alkali salts are water soluble in all three forms, whereas of the earth alkali-salts only the primary salts are water soluble. In the reactions taking place in saps, and tissue fluids of plants and also animals, only the ions of mono- and di-phosphate are constant. Pyro-phosphoric acid has only in isolated cases a significance in organic combinations.

Phosphatides

Among the organic phosphorus combinations in plants and especially in seeds, there have been identified phytin, the calcium and magnesium salts of the inosicphosphoric acid. Similar organic phosphoric acid combinations are hexosediphosphoric acid and glycerol-phosphoric acid in which phosphoric acid is split through ferments and also through microorganisms. These and similar organic phosphoric acid combinations serve as the building blocks of phosphatides, nitrogen- and phosphoric-acid-containing organic combinations widely distributed in the plant kingdom, which are related chemically as well as physically to fats. In this manner, the lecithins contain choline as its nitrogen-containing base, and this in acetylated form activates the peristaltic movements of intestines, whereas kephalin, closely related in structure to lecithin, contains nitrogen as colamin. Weenders' feedstuffs analysis does not touch the phosphatides directly, but the fat-soluble constituents are found in the ether extract, whereas the inorganic constituents, the phosphoric acid remnant, is to be codetermined in the ash. The significance of these phosphatides for the animal organism is extremely great. Recent investigations showed that fatty acids are resorbed in the intestines through phosphorylation, and the originating phosphatides should be regarded as transporters of fats, particularly because phosphatides differ from neutral fats mainly through their water solubility. Phosphatides

* See references at end of article.

are stored mainly in the brain and in the ductless glands. The young growing animal has a large supply of lecithin, but this quickly diminishes with advancing age, so that there may exist reciprocal activities between organic phosphoric acid constituents and biological manifestations of animals.

H. Roth (*2*) has worked out two processes to prove the existence of phosphatides in plant matter, one of which applies to dry matter and to fresh material, whereas the second is a quick method but can only be applied to small quantities of dry matter. Both methods use extraction of materials with methanol, adsorption on lead sulphide from dilute methanol solution, and washing with pure methanol. The phosphatide phosphorus is determined photoelectrically in the extractants according to the molybdenum blue method. The accuracy is measured +3%.

Table 2 containing excerpts from the work of H. Roth (*2*) gives the phosphatide content of seeds of a number of legumes and cereals. The table shows a high phosphatide content for legumes, whereas grains possess only about half as much.

Other Phosphorus Combinations

The association between phosphoric acid and nitrogen-containing albuminous matter in organic combinations is not limited to those so far mentioned; they extend to more complex organic combinations such as the proteins. These composite albumin bodies possess, besides albumin, also a non-albuminous closely allied group, by which they are again subdivided into several different groups.

In this class are the nucleo-proteins containing phosphorus and they form the main constituent of cell nucleus, hence the name. Their closely allied group are nucleic acids of high molecular weights; their albumin substances are purin- and pyrimidin-bases. The nucleic acids are split through hydrolysis into the nucleic bases mentioned, further into the d-ribose and in phosphoric acid. Among the other different proteins of importance are the phosphoproteins, recognizable by name as phosphorus containing, whose prosthetic group is formed by phosphorus. The phosphoprotein most important in this connection is the casein of cow's milk, representing the main constituent of lactalbumin and is dissolved in milk as a calcium salt. Caseins from other milk sources show different compositions. Composition of casein from cow's milk may be visualized from Table 3.

TABLE 3

ELEMENTARY ANALYSES OF CASEIN FROM COW'S MILK (IN %)

Analyst	C	H	N	S	P
	%	%	%	%	%
Hammersten (*3*)....	52.96	7.05	15.65	0.758	0.847
Lehmann & Hempel (*4*).....	54.00	7.04	15.60	0.771	0.847
Ellenberger (*5*).....	53.07	7.13	15.46	0.760	0.800

C = carbon; H = hydrogen; N = nitrogen; S = sulphur; P = Phosphorus

Despite the fact that the casein had different degrees of purity due to acidifications and several purifications carried out in reactions at the iso-electrical point (*p*H 4.7), the analyses nevertheless show a decided uniformity in the values as shown. The phosphorus content of casein according to these elementary analyses, about 0.85 per cent, exceeds the sulphur content and must be designated as relatively high. The constituent analysis of casein showed the absence of glycol but a comparatively high content of tyrosine, oxyglutamic acid, tryptophane and cystine. The enormous quantities of milk produced by first class dairy cows up to 30 liters per day and the high requirements of phosphorus solely for this purpose alone to form casein

(Continued on page 28)

TABLE 2

PHOSPHATIDE PHOSPHORUS CONTENT OF SEEDS IN MG—%

Seeds	in Dry Matter mg % Phosphatide phosphorus	% Total P	% Total N	% Phosphatide P of Total P	% Phosphatide N of Total N
Soybeans	55.5	0.85	6.25	6.53	0.40
Sweet Lupine, Yellow	60.0	0.63	7.30	9.50	0.37
Sweet Lupine, Blue	55.0	0.51	5.21	10.80	0.48
Beans	45.3	0.48	3.90	9.45	0.52
Peas	44.2	0.51	3.90	8.66	0.51
Lentils	41.0	0.36	4.27	11.38	0.43
Oats	31.2	0.44	2.10	7.10	0.64
Wheat	21.1	0.44	2.11	4.80	0.45
Barley	20.8	0.44	1.65	4.72	0.57
Rye	17.8	0.43	1.55	4.14	0.52

Changes in the Fertility of Some Tomato Producing Soils of New Jersey and Pennsylvania

By J. B. Hester, G. E. Smith and F. A. Shelton

Department of Agricultural Research, Campbell Soup Company, Riverton, New Jersey

During the course of the past ten years there have been some changes in soil conditions and crop production in New Jersey and eastern Pennsylvania which are believed to be significant. For example, for the five-year period prior to 1939 the average number of ten-ton tomato growers in New Jersey was 22; whereas, the average number in the five-year period prior to 1948 was 272 or an increase of 1136 per cent. Furthermore, a hundred growers produced fifteen or more tons per acre in 1947 (1). Because of this change, some of the variations in soil fertility factors are to be presented.

The soil samples analyzed in this survey were taken under similar conditions to those taken in the fall of 1938 (2). The samples were taken with specially constructed soil tubes, air dried, and analyzed by the same method (3). For the most part, the samples came from the same farms and since there are some 4,000 to 5,000 soil samples represented, it is believed that the changes are valid.

pH Value of Soils

The relation of the *p*H value of the soils to the available calcium and magnesium content and availability of phosphorus and other nutrient constituents in the soil has been established. Consequently, the *p*H value of the soil within itself is of value in indicating the fertility condition of the soil. In order to not complicate the situation too much, the data from five counties—4 in New Jersey and 1 in Pennsylvania—are being presented. These results are shown in Table 1 and are calculated on the basis of percentage distribution for various *p*H ranges.

It will not be necessary to discuss all of these data, but suppose we take the sandy loam soils in Burlington County. The fact that tomato production, on average soils, is depressed at *p*H values below 5.9, it is significant to note that 86 per cent of the soils taken in the fall of 1938 were below *p*H 5.9 and 13 per cent above *p*H 6.0 Of the samples taken in the fall of 1947, 44 per cent were below *p*H 5.9 and 56 per cent above *p*H 6.0. This is a characteristic of all the data presented and, as the rest of the data are discussed, the relation of the change to other soil fertility factors will be brought out.

TABLE 1

The Percentage Distribution of the pH Value of Soils in New Jersey and Pennsylvania

pH Value	A '39	A '48	B '39	B '48	C '39	C '48	D '39	D '48	E '39	E '48
Sands										
—4.9	6	3	7	5	10	3		2		
5.0—5.4	35	14	28	16	20	12		6		
5.5—5.9	44	31	47	35	51	38		18		
6.0—6.4	13	34	14	24	10	36		50		
6.5—6.9	2	15	4	13	7	10		18		
7.0—		3		7	2	1		6		
Sandy Loams										
—4.9	3	3	12	4	3	4	2			
5.0—5.4	34	15	30	18	30	13	17	4		
5.5—5.9	50	26	29	34	42	32	50	20		
6.0—6.4	11	32	17	24	22	38	16	48		
6.5—6.9	2	20	11	13	2	12	14	24		
7.0—		4	1	7	1	1		4		
Loams and Silt Loams										
—4.9	8		25	*			3		7	1
5.0—6.4	40	12	29		26		23	16	26	13
5.5—5.9	35	46	29		50		43	22	31	23
6.0—6.4	15	22	14		24		19	31	22	33
6.5—6.9	2	14	2				9	31	9	21
7.0—		6					3		5	9

* Not sufficient samples to give significant results.

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Magnesium

Serious magnesium deficiency on some of the lighter soils occurred as late as 1946 (4). However, the information in Table 2 indicates that there are a lesser number of soil samples showing "poor" and "fair" tests for magnesium. This is particularly true in Camden, Gloucester and Salem Counties where much of the magnesium deficiency occurred.

Phosphorus and Potash

In keeping with the change in *p*H, the number of soils showing a "good" test for phosphorus has greatly increased. Un-

TABLE 2

THE PERCENTAGE DISTRIBUTION OF EASILY SOLUBLE MAGNESIUM IN SOILS

TEST	A '39	A '48	B '39	B '48	C '39	C '48	D '39	D '48	E '39	E '48
Sands										
Poor	4	9	7	4	17	14		7		
Fair	30	21	56	11	51	25		26		
Good	66	70	37	85	32	61		67		
Sandy Loams										
Poor	2	1	7	7	5	11	3	5		
Fair	19	12	44	11	42	16	28	7		
Good	79	87	49	82	53	73	69	88		
Loams and Silt Loams										
Poor	2		6				3	3		1
Fair	22	5	49		42		24	6	7	1
Good	76	95	45		58		73	91	93	98

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TABLE 3

THE PERCENTAGE DISTRIBUTION OF EASILY SOLUBLE PHOSPHORUS IN SOILS

TEST	A '39	A '48	B '39	B '48	C '39	C '48	D '39	D '48	E '39	E '48
Sands										
Poor	46	10	44	37	37	7		10		
Fair-	23	2	35	2	29	23		2		
Fair	27	14	20	19	27			10		
Good	4	74	1	42	7	70		78		
Sandy Loams										
Poor	66	28	57	38	50	21	68	28		
Fair-	21	5	20	2	28	5	20	5		
Fair	11	16	15	9	18	13	12	11		
Good	2	51	6	51	4	61		56		
Loams and Silt Loams										
Poor	74	54	81		21		84	38	77	56
Fair-	19	6	13		18		13	3	17	20
Fair	7	17	6		50		3	18	5	
Good		23			11			41	1	24

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doubtedly, the two factors—the use of more lime and the use of larger amounts of fertilizer—are the reasons for this change as shown in Table 3.

Since these phosphorus tests have changed, it means that the fertilizer used in the future will not have to be as high in phosphorus as those used in the past. It is believed that these data bring out another significant fact. There are still quite a number of tests that are "poor," but the number testing "fair" have decreased. This probably indicates that the grower whose soils tested "fair" in 1939 now has a "good" test, while some growers are continuing along the same lines as before.

TABLE 4

THE PERCENTAGE DISTRIBUTION OF EASILY SOLUBLE POTASH IN SOILS

TESTS	A '39	A '48	B '39	B '48	C '39	C '48	D '39	D '48	E '39	E '48
Sands										
Poor	26	43	26	50	74	53		52		
Fair-	42	15	37	18	24	25		8		
Fair	31	19	37	16	2	8		16		
Good	1	23		16		14		24		
Sandy Loams										
Poor	20	40	31	51	70	53	37	50		
Fair-	40	16	43	24	22	8	40	12		
Fair	40	22	24	10	8	22	22	20		
Good		22	2	15		17	1	18		
Loams and Silt Loams										
Poor	38	52	46		37		37	75	60	30
Fair-	38	11	33		50		38	19	28	43
Fair	23	17	19		13		25	6	11	
Good	1	20	2						1	27

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The number of samples testing "good" in potash (Table 4) have also increased, but not as much as the ones testing "good" in phosphorus. It is not believed, however, that the change in potash is sufficient to justify any change in the amount of potash used.

REFERENCES

1. The 1947 Ten-Ton Tomato Club Report, N. J. Canners Association.
2. Hester, J. B. and F. A. Shelton. The relative fertility of certain tomato producing soils for the canning industry. American Fertilizer, May 1939.
3. Hester, J. B. and F. A. Shelton. The employment of soil chemistry in the production of maximum crop yeilds, 1946. Res. Mon. 2, Campbell Soup Co.
4. Hester, J. B., G. E. Smith, and F. A. Shelton. The relation of rainfall, soil type and replaceable magnesium to deficiency symptoms. 1947 Proc. of A. S. H. S. 49:304–308.

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Principal Articles in This Issue

PAGE

THE BIOCHEMICAL SIGNIFICANCE OF PHOSPHORIC ACID FOR FARM ANIMALS *by Rudolf Schreiber* 7

CHANGES IN THE FERTILITY OF SOME TOMATO PRODUCING SOILS OF NEW JERSEY AND PENNSYLVANIA, *by J. B. Hester, G. E. Smith and F. A. Shelton* .. 10

Influence of Radioactive Materials on Crop Plant Growth to be Studied 12

American Plant Food Council Annual Convention 13

February Tag Sales 14

FERTILIZER MATERIALS MARKET
New York 15
Charleston 16
Philadelphia 16
Chicago 18

Commercial Solvents Earnings Increase . 18

Chemical Construction Corp. to Build Mexican Plant 20

Fertilizer Exports and Imports, 1947.... 24

St. Regis Paper Co. Annual Report 28

Influence of Radioactive Materials on Crop Plant Growth to be Studied

The U. S. Atomic Energy Commission and the U. S. Department of Agriculture have announced that a study of the influence of radioactive materials on growth of crop plants will be started at once. The research will be financed by a grant from the Atomic Energy Commission to the Bureau of Plant Industry, Soils, and Agricultural Engineering. It will be conducted by a number of agricultural experiment stations cooperating with the bureau. Part of the special materials required will be provided by the Atomic Energy Commission.

This is the first agricultural study to be financed by the Commission. The Commission and the Department pointed out that this study breaks new ground in more than 200 current studies financed and operated by the Federal Department of Agriculture and State Agricultural Experiment Stations using radioactive isotopes made in the AEC's reactor at Oak Ridge, Tenn.

The isotopes are used as a new tool—tracer—in research projects designed to determine facts about the growth and development of plants, insects, and animals. The new project will be aimed to find facts about the effects of radio-active materials used in fertilizer applications, not as tracers measuring the effects of standard fertilizer materials, but as direct influence on the fertilized crops.

The investigation is designed to determine the answers to a number of questions on the relationships between plant growth and radioactivity. It has been known for a long time that all soils are radioactive to some degree. Will applications of radioactive materials improve plant growth? If so, to what extent? If the radiation does affect plant growth, what is the relation of natural radioactivity in the soil to the amount needed for stimulation? How will it affect time of maturity in the plant? What degree of radioactivity will the crop have as a result of the application?

Many experiments have been conducted in Europe and America to study the influence of radioactivity on plant growth. The results have been conflicting and inconclusive, showing apparently beneficial effects in some cases, no influence whatever in others, and apparently harmful effects in still others. Reports of exceptionally good crops near Nagasaki have stimulated interest in the problem. Investigations by qualified American and Japanese scientists, however, fail to reveal any basis

for the claim that radiation from the atomic bomb benefited the crops.

Except for experimental purposes the use of radioactive materials by farmers cannot be recommended on the basis of present knowledge. Many important questions must be answered before the exact influence of radioactive materials on plant growth is known.

In the cooperative project now getting under way, radioactive materials will be used in both greenhouse and field experiments on a variety of crops grown on different soil types. Three-fold objective of the research is: (1) to measure the effect of additions of radioactive materials to soil and fertilizer on the growth, maturity, yield, and composition of various representative crops; (2) to determine the influence of low activities of alpha, beta, and gamma radiation on the germination of seed and the growth and vigor of seedlings; and (3) to ascertain the influence of the radioactive materials on the number and activity of the bacteria and other soil micro-organisms.

N. F. A. Board To Meet in Alabama

The annual spring meeting of the board of directors of the National Fertilizer Association will be held in Florence, Ala., on April 14. On the following day, the directors will be guests of Gordon R. Clapp, chairman of the board of the Tennessee Valley Authority during a vist to the authority's fertilizer production facilities.

Appropriation Asked for Uraform Pilot Plant

The appropriation bill for the U. S. Department of Agriculture, which is now being debated in Congress, contained an item of $45,000 for the construction of a pilot plant for the experimental production of Uraform, a slowly soluble, non-leaching nitrogen fertilizer made from urea and formaldehyde. This material, developed by the Department's scientists and announced at a fertilizer conference in April, 1947, was also valuable as a conditioner of fertilizer mixtures, due to its being unaffected by moisture adsorption. The appropriation requested would enable sufficient production for more extended field experiments and would at the same time produce valuable data on large-scale production problems. The House eliminated this item from the bill but it is thought that it may be restored by the Senate.

American Plant Food Council Annual Convention

The American Plant Food Council has announced that the 1948 annual convention will be held at the Greenbrier, White Sulphur Springs, W. Va. on June 13, 14, 15, and 16 1948. An interesting program is being arranged which will include addresses by nationally known educators, soil scientists, agricultural editors and members of Congress. Convention arrangements are being handled by a committee consisting of W. T. Wright, F. S. Royster Guano Co., Norfolk, Va.; G. E. Petitt, Potash Co. of America, New York; J. A. Howell, Virginia-Carolina Chemical Corporation, Richmond, Va.

Convention Committee of the American Plant Food Council
W. T. Wright, G. E. Petitt, J. A. Howell

New Australian Plant to Produce Sulphate of Ammonia

The Electrolytic Zinc Company of Australia is planning to build a plant for the production of sulphate of ammonia at Risdon, Tasmania. A production of 50,000 tons annually is expected. The plant will use the process for recovering sulphur from its zinc concentrates and a plentiful supply of hydroelectric power will provide the necessary synthetic ammonia. It is expected that the new production will make possible increased exports of sulphate of ammonia to the Pacific markets.

February Tag Sales

Sales of fertilizer tax tags in the 15 reporting States during February were equivalent to 1,149,000 short tons, according to reports of State control officials to The National Fertilizer Association. Compared with the 1,185,000 tons reported for a year ago, sales during February were three per cent lower; and compared with February 1946, sales were 17 per cent lower.

The decrease in sales from a year ago was caused by a decline in the tonnages reported for the Southern States. Sales in these 11 States during February totaled 981,000 short tons, a six per cent drop from the 1,042,000 tons reported for the preceding February. By individual States, sales in South Carolina, Florida, Alabama and Oklahoma increased, but sales in the remaining seven States were lower, with decreases ranging from 500 tons for Virginia to 91,000 tons for North Carolina.

February tag sales for the four Midwestern States, however, were greater than for a year ago. Total sales of 168,000 tons were 18 per cent above the 142,000 tons reported for last February. By States, only Kansas had lower sales.

Tag sales during January-February in the 15 States, amounting to 2,605,000 short tons, were one per cent greater than the 2,588,000 tons reported for the same period last year. Sales for the Southern States were four per cent below last year, although six of these States reported increases. Total sales in the Midwestern States increased 31 per cent over the first two months of 1947, with each of the four States reporting an increase.

FERTILIZER TAX TAG SALES

COMPILED BY THE NATIONAL FERTILIZER ASSOCIATION

State	February				January–February		
	1948 Tons	1947 Tons	1946 Tons	% of 1947	1948 Tons	1947 Tons	1946 Tons
Virginia	71,259	71,736	86,517	101	166,665	165,350	167,227
N. Carolina	168,652	259,504	304,396	83	480,886	581,722	598,361
S. Carolina	166,186	130,270	171,320	111	360,931	325,165	331,209
Georgia	189,500	214,800	244,561	100	415,711	415,390	414,204
Florida	100,835	70,703	106,574	111	185,843	167,936	238,728
Alabama	167,671	120,130	193,150	101	290,778	287,350	316,450
Tennessee	34,305	38,475	57,919	82	63,872	78,040	83,371
Arkansas	20,095	39,200	27,600	52	33,536	64,800	41,500
Louisiana	19,000	28,980	38,900	89	45,877	51,630	67,360
Texas	25,250	55,765	40,625	94	93,073	98,839	92,287
Oklahoma	18,103	12,550	6,850	155	40,162	25,900	14,350
Total South	980,856	1,042,133	1,278,412	96	2,177,334	2,262,122	2,365,047
Indiana	50,805	46,527	39,753	126	159,808	127,114	122,976
Kentucky	58,127	49,000	38,513	124	144,731	116,253	105,083
Missouri	50,035	36,130	20,532	152	96,063	63,020	73,619
Kansas	8,750	10,810	5,931	141	27,540	19,598	10,481
Total Midwest	167,717	142,467	104,729	131	428,142	325,985	312,159
Grand Total	1,148,573	1,184,600	1,383,141	101	2,605,476	2,588,107	2,677,206

FERTILIZER MATERIALS

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FERTILIZER MATERIALS MARKET

NEW YORK

Sale of Fertilizer Organics Improves but Feed Market Slow. Shortage in Nitrogen Materials Continues. Continued Coal Strike Will Curtail Sulphate of Ammonia Production. Potash Shipments Improve. Superphosphate in Better Supply

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, March 31, 1948.

Organics

There was a slight pickup in the demand for organic fertilizer materials with the approach of the heavy shipping season. Manufacturers were forced to go into the market to pick up additional supplies. The feed trade, however, was still slow and bought only a limited amount of material. Tankage and blood were quoted around $7.00 per unit of ammonia ($8.51 per unit N). There were numerous resale lots of vegetable meals, with soybean meal quoted about $73.00 per ton, Decatur, Ill., in bulk, and cottonseed meal $80. per ton in bags, f.o.b. Memphis, Tenn. Linseed meal was firmer due to the shorter supply on hand.

Fish Meal

Some unground fish scrap for future on a "when and if made" basis was reported sold at $140. per ton, f.o.b. fish factories for summer shipment. This was bought mostly by the feed trade, with the fertilizer buyers only buying a limited quantity. Several lots of imported fish meal were reported arriving.

Castor Pomace

Offerings were available from the producers as some buyers were forced to postpone deliveries on old contracts due to the lateness of the season and shortage of storage space. A steady demand, however, was reported.

Nitrogen Solutions

Buyers were eagerly taking their allotments of this material because the tight situation in other nitrogen materials has caused a shortage of nitrogen in general.

Potash

Manufacturers were shipping against old contracts and report the box car situation fairly good and shipments keeping up to schedule. Some more imported material was reported on the way from Europe.

Sulphate of Ammonia

If the coal strike continues, it is inevitable that the supply of this material will be cut down and some producers forced to stop making shipments on contracts. Fertilizer manufacturers may have to use other materials in the place of sulphate of ammonia.

Superphosphate

This material was in better supply with the exception of certain areas, no shortage was reported and producers were able to keep up their shipping schedules. Triple superphosphate was still in short supply.

Nitrogenous Material

Some material was reported offered under $5.00 per unit of ammonia ($6.08 per unit N), at one shipping point but no great quantity was involved. Other producers were holding to their price schedule.

Nitrate of Soda

As fast as the boats arrive carrying this material from Chile, the material is shipped out to the buyers. Certain sections report a shortage for top dressing.

Hoof Meal

No activity was reported in this market, and the demand from the fertilizer trade was rather poor.

Ammonium Nitrate

Buyers have been disappointed in the amount of this material they have received this season and it does not cover their requirements. Very little improvement in the situation is looked for in the near future.

CHARLESTON

Heavy Sales of Mixed Fertilizers Reported with Shipments Improving. Nitrogen Still Short. Organics Demand Slack

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, March 29, 1948.

The prolonged wet weather conditions in the Southeast have delayed movement of the fertilizer considerably, but in the last week movement has been heavy, and some manufacturers report that they are almost completely sold out. The prime worry on the part of manufacturers now is whether they will be able to obtain sufficient nitrogen, as this is extremely short.

Organics.—Demand for organics is exceedingly slack, and producers are anxious to do business. There is practically no market at present. South American organics are bringing no interest from fertilizer buyers.

Castor Pomace.—Producers are still asking around $40.00 per ton f.o.b. production points in the East, but few sales are reported. Most buyers are not interested at the present time in contracting for future shipment.

Potash.—Contract schedules are being adhered to, with no easement in the demand. The amount of spot potash will be spread very thinly.

Nitrate of Soda.—Importations are on schedule, and it is expected that the total allocation will arrive before June 30th. Demand is extremely heavy, particularly in view of the drop in production of sulphate of ammonia.

Sulphate of Ammonia.—The shortage of sulphate of ammonia is being aggravated by the coal strike, and buyers are exceedingly worried about their supplies for this season's mixing requirements.

Dried Ground Blood.—The market at New York and Chicago is nominally $7.50 per unit of ammonia in bulk, with the only interest being shown by the feed trade.

Tankage.—Tankage is quoted at around $7.50 per unit of ammonia ($9.12 per unit N), at Chicago, and around $8.00 ($9.72 per unit N), at New York.

Superphosphate.—Stocks at the end of January were slightly higher than for the same period last year, and the supply situation is easier than for the same period last year.

Phosphate Rock.—Conditions remain tight, with quite a number of acidulators complaining of inability to get delivery on schedule against contracts.

PHILADELPHIA

Improvement Reported in Mixed Fertilizer Shipments. Resale Sulphate of Ammonia Brings High Prices. Potash Shipments Better

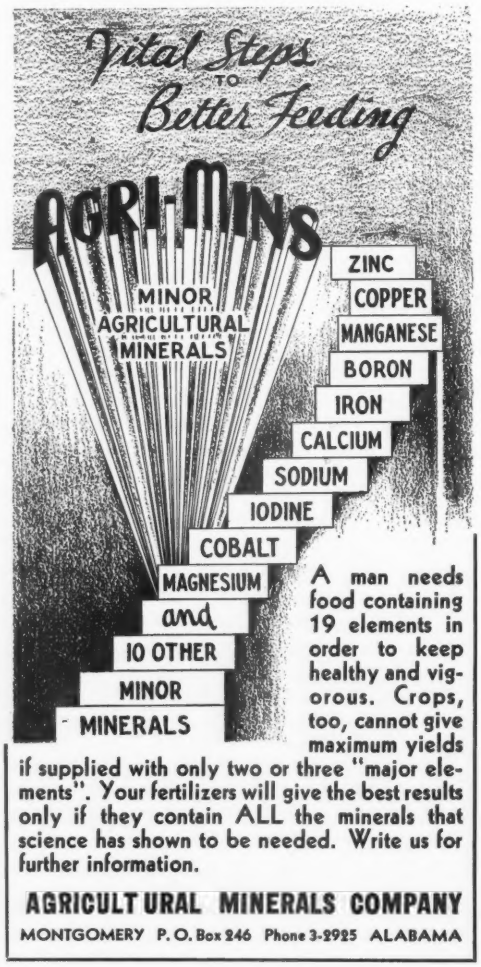
Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA. March 29, 1948.

Mixed fertilizers are now moving out and the crowded condition at the factories is being somewhat relieved. The supply of chemical nitrogen is still insufficient and the shortage for top-dressing is being keenly felt.

Sulphate of Ammonia.—The demand is very strong with resale quoted as high as $75.00 per ton. Production is hindered by coal shortage.

Nitrate of Soda.—While imports are keeping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on schedule, there is not sufficient to meet the demand.

Ammonium Nitrate.—Demand continues strong with the supply hopelessly inadequate.

Castor Pomace.—This is now in ample supply at $40.00 per ton at producing plants.

Blood, Tankage, Bone.—Labor trouble is interfering somewhat with production, but the demand is not too strong. Blood has been reported at $7.50 to $8.00 per unit of ammonia, with tankage proportionately lower. While raw bone seems to be not too free, steamed bone meal sold at $50.00 to $55.00, depending on the grade.

Phosphate Rock.—The supply position is not any easier, but is expected to improve before very long, due to increased production facilities.

Superphosphate.—Production is reported to have slipped some from the December peak and the supply position for normal is somewhat easier.

Potash.—Shipments of domestic, and also French commitments, are reported moving per schedule. It is reported that several thousand tons of muriate, of Russian origin, have been offered for later shipment at equivalent to $1.20 per unit, c.i.f.

CHICAGO

Packing House Strikes Cause Little Change in Slow Organics Market. Some Prices Show Declines

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, March 29, 1948.

Thus far the curtailed production of animal ammoniates, due to the packing house strikes, has not had any salutary effect on the market value of these products. Whether or not this will become manifest later on, depends upon how long the strike will last and the extent of plant shutdowns. At present the market is in the doldrums with no apparent pressure on either the buying or selling side of the market and a careful study of the prevailing position indicates a lack of vigorous support of present values.

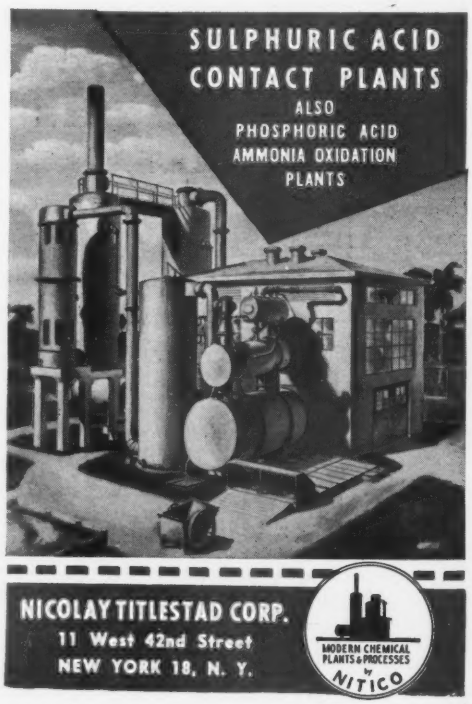
Dried blood and wet rendered tankage both are reported selling at $7.00 per unit of ammonia ($8.51 per unit N), which represents a 50 cent decline. Dry rendered tankage is nominally quoted at $1.50 to $1.60 per unit of protein, f.o.b. shipping points. Steam bone meal unchanged at $60.00 to $70.00 per ton for 60 to 70 per cent B.P.L. material with the lower figure probably closer to actual trading basis.

Commercial Solvents' Earnings Reflect Expanded Facilities

Net sales, net profits, payrolls, and dividends paid to stockholders were higher in 1947 than in any year in the history of Commercial Solvents Corporation, Henry L. Perry, President, disclosed in the company's annual report issued recently.

Expansion and diversification of the company's operations are continuing. Expenditures for buildings and equipment amounted to over 4½ million dollars in 1947, and it is estimated that an additional sum of $5,000,000 will be required to complete all the projects at present in various stages of construction. The two principal projects authorized in 1947 were an increase in the facilities for penicillin production, and additional laboratories and equipment for the Research Department which will more than double present research facilities.

The ammonia plant at Sterlington, Louisiana, purchased in 1946, operated at capacity throughout the year. The report reveals that arrangements have been made to secure additional production of anhydrous ammonia, but this will not become available until 1949. The large methanol unit is nearing



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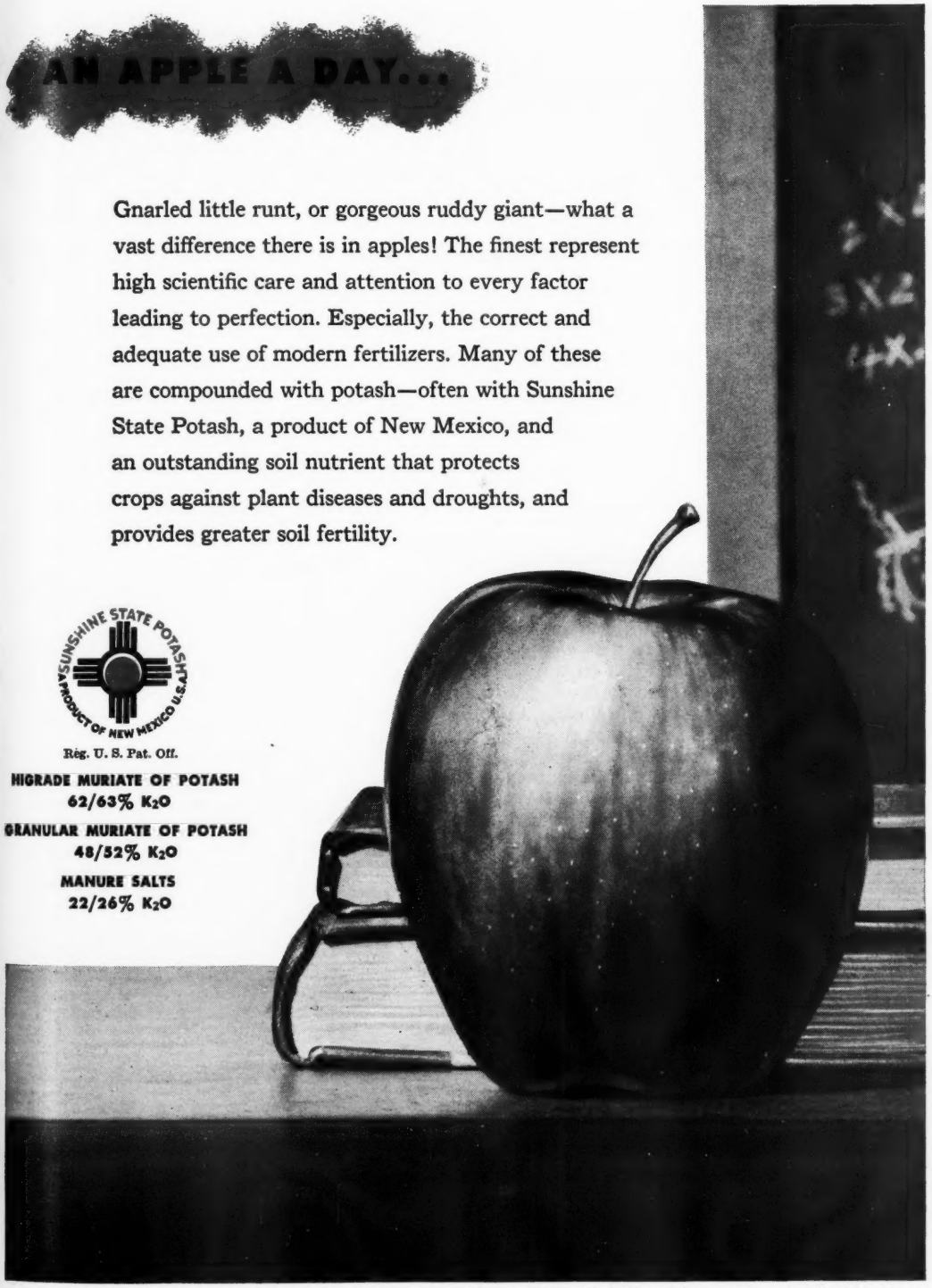

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completion and is expected to be in opreation this spring with an output many times that of the Peoria methanol unit.

The new plant at Terre Haute for the manufacture of benzene hexachloride, the new insecticide, started production in 1947. Another project completed was the enlargement of formaldehyde plant at Agnew Cal.

Consolidated earnings for 1947 were $9,068,430, equal to $3.44 a share, compared with $5,719,779 or $2.17 a share for 1946. Net sales were $54,915,983 in 1947 compared with $41,874,998 in 1946.

Obituaries

Lester E. Britton

Lester E. Britton, manager of the Fertilizer Department, Consolidated Rendering Co., Boston, Mass. died from a heart attack on March 23rd.

In years of service, Mr. Britton was one of the veteran members of the industry. He was for many years manager of the Lowell Fertilizer Company and continued in that capacity when the company became a part of the Consolidated Rendering Company in 1928. He later was promoted to manager of all fertilizer production for Consolidated and was elected a director of the Company.

Throughout his entire business career, Mr. Britton has taken an active part in industry affairs. Since the days of the first World War, he has given valuable service on various committees of the National Fertilizer Association and at the time of his death was a member of the Board of Directors. A regular attendant at industry meetings, Mr. Britton had a wide circle of friends in every section of the fertilizer territory, who sincerely mourn his departure.

William C. Geoghegan

William C. Geoghegan, formerly a vice-president of the Davison Chemical Corporation, died in Baltimore on March 20th. He was 69 years of age. Prior to his retirement four years ago, Mr. Geoghegan had been in charge of the company's New Orleans plant for more than 10 years.

H. S. Roop

H. S. Roop, president of the Baltimore Fertilizer Co., Baltimore, Md., died on March 7th. Mr. Roop, who was 86 years old, had served as president of the company for more than 40 years and was active in the business almost to the day of his death. He is survived by his widow and four children.

Chemical Construction Corp. to Build Mexican Plant

The Mexican Embassy in Washington and the Export-Import Bank has announced that the Board of Directors of the Bank have authorized a credit of up to $6 million to Nacional Financiera, S. A., a financial agency of the Mexican Government, for the purchase of United States equipment, materials, and services required for the construction of an ammonium sulphate plant near Mexico City.

This credit was authorized in accordance with the commitment made by the Export-Import Bank to extend credits aggregating $50 million to finance projects approved by the Mexican Government and acceptable to the Bank.

The proposed ammonium sulphate plant is to be constructed and operated by Guanos y Fertilizantes, S. A., which is wholly owned by Nacional Financiera. The total investment required to establish the plant is estimated at $10 million, of which $6 million will repre-

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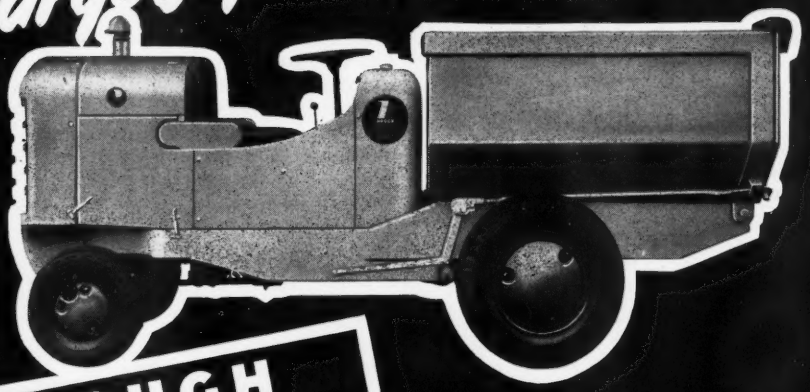

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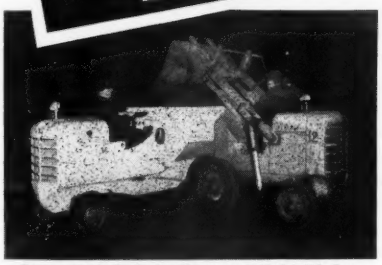

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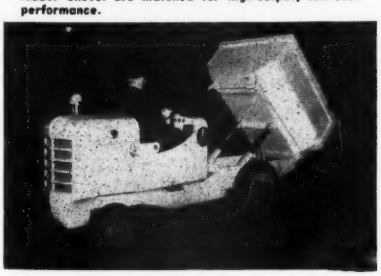

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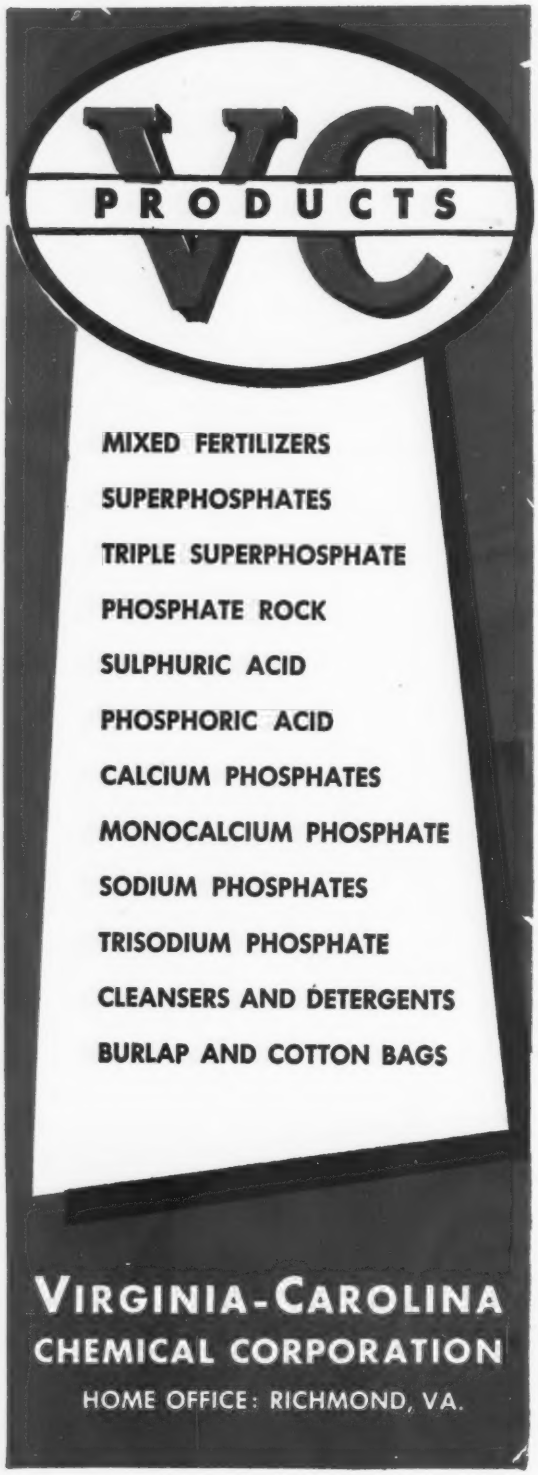

sent cost of U. S. equipment, materials and services. The other $4 million is required to cover costs of Mexican equipment, materials and labor as well as working capital and will be supplied by Guanos y Fertilizantes. Plans and cost estimates for the proposed ammonium sulphate plant have been prepared by Chemical Construction Corporation of New York City, which is to have continuing responsibility for final design, supervision of plant construction and technical supervision of production operations for a period of not less than three years. The plant is to have a daily capacity of 200 short tons of ammonium sulphate, which is to be produced from ammonia synthesized from natural gas and sulphuric acid manufactured from raw sulphur. The natural gas required will be obtained from a pipeline which Petroleos Mexicanos is now constructing from the Poza Rica field to the Mexico City district for the supply of industrial consumers. Sulphur will be obtained from the desulphurization plant which Petroleos Mexicanos is to erect at Poza Rica to clean the gas prior to transmission through the pipeline.

On the basis of operation 350 days per year, the plant will have an annual production capacity of 70,000 short tons of ammonium sulphate and approximately 17,000 short tons of sulphuric acid in excess of the amounts required for ammonium sulphate production. The plant is intended to supply Mexico's growing demand for nitrogenous fertilizers and is expected to make a significant contribution to the improvement and expansion of Mexico's agricultural production.

The credit will be available until December 31, 1949. The obligations of Nacional Financiera in evidence of advances under the credit will bear interest at the rate of 3½ per cent per annum, will be unconditionally guaranteed by the Mexican Government and will be payable in not more than 20 semi-annual installments beginning June 30, 1950.

Army to Lend Ammonium Nitrate for Domestic Use

The Department of Agriculture announced on March 26th that the Army has agreed to lend 9,000 tons of ammonium nitrate to private industry to help alleviate the current domestic shortage. Under an exchange arrangement, the U.S.D.A. will borrow the fertilizer now and will pay it back in July and August when demand has slackened off. The exchange will be through the Commodity

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Credit Corporation and distribution will be made through normal commercial channels.

The fertilizer obtained from the Army will be sold by CCC to commercial ammonium nitrate producers at current selling prices and a like amount will be purchased from the same producers in July and August at the same price at which it is being sold to them now. The 9,000 tons will be pro-rated to producers on the basis of the respective amounts of ammonium nitrate supplied by each for the 1947–48 commercial export program.

Hanes Joins St. Regis Labor Relations Department

St. Regis Paper Company announces the appointment of Walter W. Hanes as assistant to Alex Smalley, director of labor relations.

Mr. Hanes, who acted as a special agent for the Federal Bureau of Investigation from 1940 until the time he joined St. Regis, graduated from Ohio State University in 1935, majoring in Business Administration and Accounting, and in 1940 obtained his law degree from Georgetown University Law School, Washington, D. C.

Before becoming associated with the FBI, Mr. Hanes practiced law in the District of Columbia.

Fertilizer Exports and Imports, 1947

Exports Increase 24 Per Cent

Exports of fertilizers and fertilizer materials during the calendar year 1947 amounted to 1,561,000 short tons, valued at $35,609,000. Compared with the 1,264,000 tons reported for 1946, the increase amounted to 24 per cent; at the same time, the value of those exports increased 59 per cent.

All classes of fertilizers and materials were exported in greater quantities than in 1946. Shipments of nitrogenous materials, accounting for 17 per cent of total exports, were 63 per cent greater than in the preceding year, the greatest percentage gain being reported for ammonium sulphate. Phosphate materials, which comprised 71 per cent of total exports, increased 13 per cent over 1946; exports of concentrated superphosphate were lower, but shipments of all other types of phosphate materials were higher. The increase in exports of potash materials amounted to 6 per cent.

During 1947, exports under the U.N.R.R.A. program declined. While 122,000 short tons were so exported during 1946, only 74,000 tons were shipped in 1947. The value of such exports, however, was greater than in 1946. Shipments to China and Formosa accounted. for most of the exports under this program Lend-lease shipments during 1947 were far below those for 1946.

Ammonium nitrate produced at ordnance plants and sent by the U. S. Army to occupied countries is not included in the tables on pages 118 and 119 of this issue. Such exports averaged about 65,000 tons monthly, or 780,000 tons for the entire year.

Imports Increase 6 Per Cent

Imports of fertilizers and fertilizer materials during 1947, amounting to 1,343,000 short tons with a value of $48,763,000, were 6 per cent greater than the 1,272,000 tons reported for 1946. Compared with 1945, however, imports were 19 per cent lower. By value, imports for 1947 increased 29 per cent over 1946 and 13 per cent over 1945.

Imports of nitrogenous, phosphatic and potassic fertilizers and fertilizer materials were greater in 1947 than in 1946. Nitrogenous materials, which represented 79 per cent of total imports in 1947, increased 2 per cent over 1946. Imports of ammonium sulphate, calcium nitrate, dried blood, sodium nitrate, ammonium phosphates, tankage, and fish scrap and meal all increased. Phosphate materials, whose imports accounted for 10 per cent of total imports, increased 5 per cent over 1946; bone phosphates, normal superphosphate and concentrated super-phosphate were all imported in greater quantities than in the preceding year. Imports of potash supply for this country, were over five and one-half times as great as in 1946. Imports of other fertilizers increased slightly over 1946.

(For detailed figures, see page 26)

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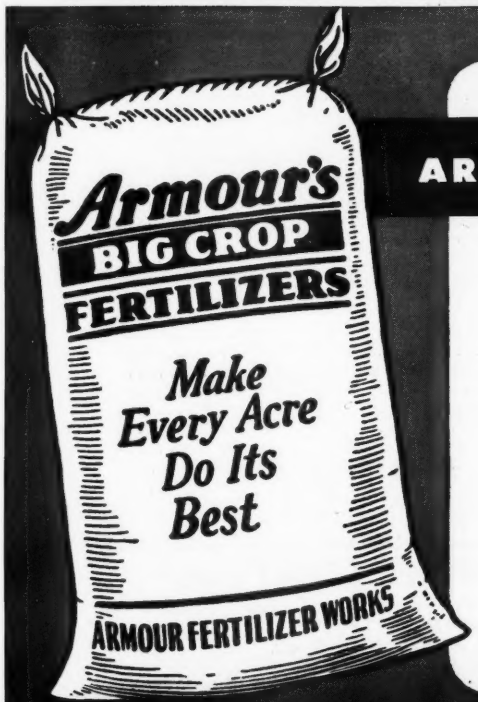

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EXPORTS AND IMPORTS OF FERTILIZERS AND FERTILIZER MATERIALS, IN SHORT TONS

SUMMARIZED BY THE NATIONAL FERTILIZER ASSOCIATION FROM U. S. DEPARTMENT OF COMMERCE RECORDS

EXPORTS*			
Ammonium sulphate	88,602	25,257	20,753
Sodium nitrate	19,920	16,185	12,229
Other nitrogenous chemicals	153,605	117,378	85,069
Nitrogenous organic waste	8,585	6,976	6,168
Total Nitrogenous Materials	270,712	165,796	124,219
Florida: High grade hard rock	133,073	116,643	80,020
Land pebble rock	436,051	379,711	303,502
Other rock	1,911	1,033	11,583
Tenn, Idaho and Montana rock	272,681	211,953	153,603
Total Phosphate Rock	843,716	709,340	548,708
Normal superphosphate	235,204	167,376	134,830
Concentrated superphosphate	25,294	102,932	72,326
Other phosphate materials	1,265	1,139	1,939
Total Phosphate Materials	1,105,479	980,787	757,803
Muriate of potash	85,779	78,257	85,343
Other potash	17,161	18,565	19,344
Total Potash Materials	102,940	96,822	104,687
Concentrated chem. fertilizers	62,609	3,765	952
Prepared fertilizer mixtures	19,157	16,399	35,321
Grand Total	1,560,897	1,263,569	1,022,982
IMPORTS			
Ammonium sulphate	114,398	101,558	118,890
Ammonium nitrate mixtures	99,414	1,105	655
Calcium cyanamide	153,764	163,093	141,057
Calcium nitrate	8,848	3,300	...
Guano	...	589	3,094
Dried blood	4,109	483	2,755
Sodium nitrate	556,525	529,677	849,888
Ammonium phosphates	105,189	91,113	92,757
Tankage	8,407	5,227	10,541
Castor bean pomace	110	322	357
Fish scrap and meal	1,980	1,248	847
Other nitrogenous materials	12,452	142,213	140,105
Total Nitrogenous Materials	1,065,196	1,039,928	1,360,946
Bone phosphates	75,297	55,284	55,397
Normal superphosphate	6,638	2,754	1,905
Concentrated superphosphate	156	40	80
All other phosphates	48,694	66,908	158,657
Total Phosphate Materials	130,785	124,986	216,039
Muriate of potash	35,284	3,452	6,861
Other potash materials	12,531	4,924	24
Total Potash Materials	47,815	8,376	6,885
Other fertilizers	98,886	98,534	80,928
Grand Total	1,342,682	1,271,824	1,664,798

* Export statistics include lend-lease and UNRRA shipments but do not include shipments of ammonium nitrate from ordnance plants.

EXPORTS OF FERTILIZERS AND FERTILIZER MATERIALS DURING 1947, BY COUNTRIES

(All data in short tons)

Canada	723,626	Austria	9
Newfoundland	386	Switzerland	3
Mexico	17,729	Finland	519
Guatemala	2,456	Poland	10,152
Br. Honduras	4	Spain	91,311
El Salvador	2,494	Portugal	73
Honduras	1,119	Malta	...*
Nicaragua	7	Italy	56,974
Costa Rica	3,134	Albania	1,792
Panama, Rep. of	412	Greece	21,971
Canal Zone	37	Turkey	1,001
Bermuda	547	Syria	...*
Bahamas	827	Iran	1
Cuba	81,246	Palestine	1
Jamaica	460	Saudi Arabia	156
Haiti	3	India	20,526
Dominican Rep.	1,710	Siam	2
Leeward I.	3,176	Br. Malaya	100
Barbados	5,810	Philippine Rep.	14,909
Trinidad	3,485	China	25,296
Curacao	83	Hong Kong	299
Fr. W. Indies	1,500	Taiwan (Formosa)	83,476
Colombia	6,562	Japan	1
Venezuela	6,419	Australia	2
Br. Guiana	1,565	New Zealand	2,559
Ecuador	69	Br. Oceania	...*
Peru	1,228	Fr. Morocco	3
Bolivia	7	Tangier	80
Chile	562	Egypt	1
Brazil	46,357	Canary I.	1,822
Uruguay	242	Madeira I.	13
Argentina	6,458	Liberia	6
Iceland	2,221	Bel. Congo	110
Sweden	71,199	Br. E. Africa	1,093
Norway	3	Madagascar	43
United Kingdom	85,299	U. of S. Africa	38
Netherlands	92,523	N. Rhodesia	37
Belgium	13,626		
France	41,927	Grand Total	1,560,897

IMPORTS OF FERTILIZERS AND FERTILIZER MATERIALS DURING 1947, BY COUNTRIES

(All data in short tons)

Canada	580,013	Eire	22
Mexico	2,124	Netherlands	3,689
El Salvador	54	Belgium	16,189
Cuba	8,075	France	19,474
Dominican Rep.	1,142	Germany	15,269
Curacao	48,683	Switzerland	972
Colombia	203	Poland	...*
Venezuela	183	Italy	...*
Ecuador	112	India	4,616
Peru	774	Siam	687
Chile	558,983	China	2,462
Brazil	3,819	Hong Kong	214
Paraguay	527	Australia	996
Uruguay	3,480	New Zealand	212
Argentina	54,817	Fr. Morocco	1,356
Sweden	8	Madagascar	60
Norway	8,826	U. of S. Africa	11
Denmark	72		
United Kingdom	4,558	Grand Total	1,342,682

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St. Regis Paper Company Reports Record Sales

The annual report of St. Regis Paper Company and subsidiaries for the year ended December 31, 1947, shows net income at a peak of $14,631,325, equal, after preferred dividends, to $2.66 a share on the common stock outstanding. This compares with $5,563,603, equal to 99 cents a share on the common stock, in the preceding year.

In a year of substantial achievements by the company, net sales mounted to a record $143,864,583, against $82,782,186 for 1946 and total assets rose to $132,643,598 from $99,170,468. Net working capital, including marketable securities at market value, at the end of 1947 is shown at $43,361,411 compared with $35,918,143 at the end of the preceding year.

In his report to stockholders, Roy K. Ferguson, president, points out that during 1947 important progress was made in the direction of effectively consolidating into the company's operations the numerous newly-acquired properties.

"We have now reached a new point of integration of timberlands, pulp mills, paper mills and converting plants which has been an important objective in planning the expansion program. Our products and markets are more diversified and we are continuing the development of new paper and plastic products. Multiwall bags for old and new customers are being produced in larger volume in our own factories from kraft paper of our own manufacture. All these factors are contributing to a greatly strengthened economic position for St. Regis."

After reviewing the accomplishments of the company in its Packaging Division, the report states: "With more paper available in 1948 and with a new, large plant, the company's twelfth, coming into production at Pensacola, Florida, adjacent to the new Alabama Pulp and Paper Company mill, and the proposed bag plant at Tacoma, further progress will be made possible. The added production is being provided to meet the requirements of new markets, especially in the feed and chemical industries, together with larger demands of present customers."

There are now more than 4,000 St. Regis packers operating in plants in the United States and 315 in Canada, the report states, after pointing out that annual installations in the United States have increased from 145 bag-filling machines in 1944 to 456 in 1946 and 585 in 1947.

Phosphoric Acid For Farm Animals

(*Continued from page 9*)

and phosphatides of milk make feeding of high quality feeds mandatory, especially of hay rich in phosphorus and calcium. It is known that for hay production the soil location is of a decisive significance. N. Zuntz (*6*) and Striegal (*7*) have compared the mineral contents of hay species which grew on acid soils poorly supplied with nutrients and on which cows were allowed to suffer osteomalacia, with the mineral content of good meadow hay, and obtained results as shown in Table 4.

TABLE 4

CALCIUM AND PHOSPHORUS CONTENT OF DIFFERENT HAY SPECIES

Description	1 kg. dry matter contains grams	
	Calcium	Phosphorus
Good meadow hay..	10.01	2.16
Poor meadow hay..	4.95	1.66

TABLE 5

RELATIVE COMPARISON OF CALCIUM AND PHOSPHORUS CONTENTS OF AN UNFERTILIZED MEADOW WITH A HIGHLY CULTIVATED PASTURE ACCORDING TO GODDEN (*8*)

Description	1 kg. dry matter contains grams	
	Calcium	Phosphorus
Unfertilized meadow.....	2.05	1.06
Highly cultivated pasture.....	17.68	4.35

Through appropriate fertilization a significant enrichment of mineral matter, meaning feed rich in calcium and phosphorus can be secured. (Table 5.)

On the unfertilized meadow which showed an acid condition there was a high mortality

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Seven hundred and fifty pounds of tankage, containing 8 per cent. phosphoric acid are being used in a mixture. What per cent. of phosphoric acid will this supply in the finished goods?

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of sheep, whereas the highly cultivated pasture had received the best of care. The differences, we see, are especially large, the phosphorus content having quadrupled and the calcium content increasing even more. Many more experimental results in this respect could be cited. For instance, S. Gericke (*9*) reports that feed from poor meadows and on which animals suffered from soft bones, contained only 0.29 per cent P_2O_5. Consideration for a sufficient phosphoric acid content of hay was pointed out by the old maestro of agricultural chemistry, Paul Wagner, many years ago, and is repeated anew by S. Gericke (*9*). Enrichment of hay can only take place through a suitable phosphoric acid fertilization and this should be carried out up to 0.6 per cent. Unfortunately meadows that have become acid are already so poor in phosphoric acid that they can produce susceptibilities to deficiency diseases. Phosphoric acid deficiencies may not appear in acute visible forms on plants, as is the case with animals, which, when exposed to phosphoric acid deficiencies for any length of time, show noticeable malformations in their skeletons. Crops may not show excessive losses in quantity yields, yet too low a phosphoric acid content materially lowers their quality and thus would be a decisive factor in producing similar results.

Summary

This short discussion should make it clear that a sufficient supply of phosphoric acid brought about by feedstuffs rich in phosphorus is not merely of casual interest, but well founded as an absolute requirement for the many-sided functions which this bio-element has to perform in the animal body. Considering that phosphorus serves to a large extent in the formation of the skeleton, functions in phosphorylation of sugar and probably also fats, that considerable amounts are needed by milch cows for milk production, that all animals eliminate some phosphorus in their urine and dung, the insistent needs made known to us by agricultural chemistry for feedstuffs rich in phosphorus become not only intelligent but constitute an urgent requirement for the maintenance of public health.

Feedstuffs rich in phosphorus can only be had through adequate amounts of phosphoric acid fertilization appropriate to the soil type. In unusually dry years feed crops have proved to be poor in phosphoric acid according to O. Kellner (*10*) because in such special cases too little rain caused a great reduction in solubility of the phosphatic fertilizers, and did not produce the crop yields expected. In normal years, however, an enrichment of phosphoric acid in all kinds of crops that are used for the nutrition of farm animals is easily accomplished, and in that way phosphoric acid requirements are supplied to animals in the manner in which they can best utilize it.

Literature Cited

1. W. Lintzel, Handbuch d. Ernährung und des Stoffwechsels der landwirtschaftlichen Nutztiere 1929. Vol. I p. 208. Berlin.
2. H. Roth, Der Forschungdienst, Special Number 12 p. 128.
3. Hammersten, Z. physiol. Chemie, 1883, Vol. 7, p. 227.
4. Lehmann and Hempel, Arch. Anatomie u. Phys. 1902 Supplement 313.
5. Ellenberger, Pflügero Archro. ges. Phys. 1894 Vol. 56. p. 558.
6. N. Zuntz, Jahrbook d. DLG 1912, Vol. 27 p. 578.
7. Striegel, Landw. Jahrb. 1883, Vol. 12 p. 823.
8. Godden, after W. Lintrel, ref. 1 above Vol. 1 Nahrstoffe und Futtermittel, Berlin 1929 p. 197.
9. S. Gericke, Dungung u. Qualität wirtschaft. Futtermittel, Z. Tieren u. Futtermittel. 1942. Vol. 6 No. 2 pp. 153–176; Die Dungung unserer Wiesen unter bes. Berucksichtigung der Phosphorsaure, Pflanzenbau, 1942, Vol. 19 Nos. 2, 3 pp. 43–89.
10. O. Kellner, Die Ernährung der landw. Nutztiere, Berlin 1903, pp. 171, 197, 283.

British Sulphuric Acid Production

The British Sulphuric Acid Association reports the production of 1,379,085 tons of sulphuric acid (100% H_2SO_4) in the United Kingdom and Eire during 1947. Operations involved 80.9 per cent of productive capacity. Consumption of acid during the same period was 1,403,871 tons. Of the latter amount, 446,784 tons were used in the production of superphosphate, and 215,054 tons in the manufacture of sulphate of ammonia.

LeRoy Transfered to Bemis General Production Department

Robert B. LeRoy has been transferred from East Pepperell to the General Production Department, Bemis Bro. Bag Co., in St. Louis, where he will continue and expand his work in testing and research on paper bags.

Mr. LeRoy, a graduate in economics from Harvard University, joined Bemis in 1938 as a member of the New York Sugar Bag Sales Division. In 1944 he transferred to the Bemis East Pepperell (Mass.) plant, developing and directing the multiwall packaging research laboratories there.

During World War II, LeRoy was active as a member of several technical committees and task groups which worked with wartime packaging problems.

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McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

BUCKETS—For Hoists, Cranes, etc.
Hayward Company, The, New York City

BUCKETS—Elevator
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARS AND CARTS
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

CHEMICALS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Commercial Solvents Corp., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Il
Lion Oil Company, El Dorado, Ark.
McIver & Son, Alex. M., Charleston, S. C.
Spencer Chemical Co., Kansas City, Mo.
Virginia-Carolina Chemical Corp., Richmond, Va.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Wiley & Company, Baltimore, Md.

CONDITIONERS
Jackle, Frank R., New York City.
Keim, Samuel D., Philadelphia, Pa.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

CYANAMID
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City

DRYERS
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

FERTILIZER (Mixed) MANUFACTURERS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Davison Chemical Corporation, Baltimore, Md.
International Minerals & Chemical Corporation, Chicago,
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Virginia-Carolina Chemical Corp., Richmond, Va.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

HOPPERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Southern States Phosphate & Fertilizer Co., Savannah, Ga.
Woodward & Dickerson, Inc., Philadelphia, Pa.

INSECTICIDES
American Agricultural Chemical Co., New York City

LEAD BURNERS
Southern Lead Burning Co., Atlanta, Ga.

LIMESTONE
American Agricultural Chemical Co., New York City
Ashcraft-Wilkinson Co., Atlanta, Ga.
Longview-Saginaw Lime Works, Inc., Birmingham, Ala.
McIver & Son, Alex. M., Charleston, S. C.

LOADERS—Car and Wagon
Hough Co., The Frank G., Libertyville, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making and Handling
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Ammoniating
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, The, East Point, Ga.
Hough Co., The Frank G., Libertyville, Ill.
Hayward Company, The, New York City
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Grinding and Pulverizing
Atlanta Utility Works, The, East Point, Ga.
Bradley Pulverizer Co., Allentown, Pa.
Pulverizing Machinery Co., Summit, N. J.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Material Handling
Atlanta Utility Works, The, East Point, Ga.
Hayward Company, The, New York City
Hough Co., The Frank G., Libertyville, Ill.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Mixing, Screening and Bagging
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MACHINERY—Power Transmission
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Superphosphate Manufacturing
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

MANGANESE SULPHATE
McIver & Son, Alex. M., Charleston, S. C.

MINOR ELEMENTS
Agricultural Minerals Co., Montgomery, Ala.
Tennessee Corporation, Atlanta, Ga.

MIXERS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

NITRATE OF SODA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Il
McIver & Son, Alex. M., Charleston, S. C.

NITROGEN SOLUTIONS
Lion Oil Company, El Dorado, Ark.
Spencer Chemical Co., Kansas City, Mo.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J. New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PHOSPHATE ROCK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Virginia-Carolina Chemical Corp., Richmond, Va.

PLANT CONSTRUCTION—Fertilizer and Acid
Atlanta Utility Works, The, East Point, Ga.
Chemical Construction Corp., New York City
Sackett & Sons Co., The A. J., Baltimore, Md.
Southern Lead Burning Co., Atlanta, Ga.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.
Titlestad Corporation, Nicolay, New York City

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City
Potash Co. of America, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
United States Potash Co., New York City

PRINTING PRESSES—Bag
Schmutz Mfg. Co., Louisville, Ky.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.

REPAIR PARTS AND CASTINGS
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BUYERS' GUIDE

SCALES—Including Automatic Bagging
Atlanta Utility Works, The, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

SCREENS
Atlanta Utility Works, The, East Point, Ga.
Link-Belt Co., Chicago, Ill.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Company, Boston, Mass.

SEPARATORS—Air
Kent Mill Co., Brooklyn, N. Y.
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SULPHATE OF AMMONIA
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Huber & Company, New York City
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

SULPHUR
Ashcraft-Wilkinson Co., Atlanta, Ga.

SULPHURIC ACID
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicaro, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
Davison Chemical Corporation, Baltimore, Md.
Huber & Company, New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
Southern States Phosphate Fertilizer Co., Savannah, Ga.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
International Minerals & Chemical Corporation, Chicago, Ill.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.
Virginia-Carolina Chemical Corp., Richmond, Va.

TAGS
Keener Mfg. Co., Lancaster, Pa.

TANKAGE
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City
International Minerals & Chemical Corporation, Chicago, Ill.
Jackle, Frank R., New York City.
McIver & Son, Alex. M., Charleston, S. C.
Woodward & Dickerson, Inc., Philadelphia, Pa.

VALVES
Atlanta Utility Works, The, East Point, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

Alphabetical List of Advertisers

Agricultural Minerals Co., Montgomery, Ala.....16
American Agricultural Chemical Co., New York City..... 4
American Potash and Chemical Corp., New York City.....17
Armour Fertilizer Works, Atlanta, Ga.....25
Ashcraft-Wilkinson Co., Atlanta, Ga.....27
Atlanta Utility Works, The, East Point, Ga.....—
Baker & Bro., H. J., New York City.....Front Cover
Bemis Bro. Bag Co., St. Louis, Mo.....Facing 18
Bradley Pulverizer Co., Allentown, Pa.....28
Chase Bag Co., Chicago, Ill.....—
Chemical Construction Corp., New York City.....23
Commercial Solvents Corp., Agricultural Div., New York City.....2nd Cover
Fulton Bag & Cotton Mills, Atlanta, Ga.....27
Gascoyne & Co., Inc., Baltimore, Md.....34
Hammond Bag & Paper Co., Wellsburg, W. Va.....—
Hayward Company, The, New York City.....34
Hough Co., The Frank G., Libertyville, Ill.....21
Huber Co., L. W. New York City.....—
International Minerals & Chemical Corporation, Chicago, Ill.....Back Cover
International Paper Co., Bagpak Div., New York City.....—
Jaite Company, The Jaite, Ohio.....—
Jackle, Frank R., New York City.....14
Keener Mfg. Co., Lancaster, Pa.....34
Keim, Samuel D., Philadelphia, Pa.....33
Kent Mill Co., Brooklyn, Ny.....27
Lion Oil Company, El Dorado, Ark.....—
Link-Belt Co., Chicago, Ill.....23
McIver & Son, Alex. M., Charleston, S. C.....25
Monarch Mfg. Works, Inc., Philadelphia, Pa.....34
Potash Co. of America, New York City.....3rd Cover
Raymond Bag Co., Middletown, Ohio.....—
Sackett & Sons Co., The A. J., Baltimore, Md.....—
Schmutz Mfg. Co., Louisville, Ky.....—
Shuey & Company, Inc., Savannah, Ga.....34
Southern Lead Burning Co. Atlanta, Ga.....26
Southern States Phosphate & Fertilizer Co., Savannah, Ga.....—
Spencer Chemical Co., Kansas City, Mo.....6
Stedman's Foundry and Machine Works, Aurora, Ind.....24
St. Regis Paper Co., New York City.....3
Tennessee Corporation, Atlanta, Ga.....23
Texas Gulf Sulphur Co., New York City.....5
Titlestad Corporation, Nicolay, New York City.....18
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.....27
Union Special Machine Co., Chicago, Ill.....—
United States Potash Co., New York City.....19
Virginia-Carolina Chemical Corp., Richmond, Va...22
Wiley & Company, Inc., Baltimore, Md.....34
Woodward & Dickerson Inc., Philadephia, Pa.....20

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